

The Applicant respectfully traverses the rejection because the Official Action has not made a *prima facie* case of obviousness.

As stated in MPEP §§ 2142-2143.01, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

The prior art, either alone or in combination, does not teach or suggest all the features of the independent claims. Independent claims 1-12 recite irradiating a semiconductor film with laser light for crystallizing the semiconductor film; removing an oxide film from a surface of the semiconductor film by etching (or treating a surface of the semiconductor film with a hydrofluoric acid) after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating after removing the oxide film (or the treatment with the hydrofluoric acid). For the reasons provided below, Morosawa, either alone or in combination with Nakajima, does not teach or suggest the above-referenced features of the present invention.

The Official Action asserts that Morosawa teaches “forming a semiconductor film comprising silicon ... over a substrate ...; oxidizing by thermal oxidation a surface of the semiconductor film to form an oxide thereon; irradiating said semiconductor film with laser light for crystallizing said semiconductor film so that the oxide is in contact with the semiconductor film ...; removing an oxide film from the surface of the semiconductor film by etching using hydrofluoric acid; leveling the surface of the semiconductor film by heating in a nitrogen atmosphere with a concentration less than 10 ppm oxygen ...; forming a gate insulating film on the semiconductor film after leveling the surface of the semiconductor film” (page 3, Paper No. 0306). The Official Action implicitly concedes that Morosawa does not teach or suggest removing an oxide film from a surface of a semiconductor film by etching after irradiation of a laser light and before leveling the surface of the semiconductor film by heating.

In the “Response to Arguments” section, the Official Action asserts that “the selection of any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results” (page 4, *Id.*). The Official Action appears to be using a quotation from MPEP § 2144.04.IV.C; however, this section of the MPEP deals with “Changes in Sequence of Adding Ingredients” and does not appear to relate to a method of manufacturing a complex electrical device such as the presently claimed method of manufacturing a semiconductor device. In any event, the Applicant respectfully submits that the claimed order of steps in the present claims is not rendered *prima facie* obvious by the teachings of Morosawa and the Official Action has not demonstrated that one of ordinary skill in the art at the time of the present invention would have been motivated to make the extensive changes necessary to rearrange the steps of the Morosawa process so that they are the same as the steps recited in the present claims.

Specifically, the independent claims clearly recite, in order, steps of (1) irradiating a semiconductor film with laser light for crystallizing the semiconductor film; (2) removing an oxide film from a surface of the semiconductor film by etching (or treating a

surface of the semiconductor film with a hydrofluoric acid) after the irradiation of the laser light; and (3) leveling the surface of the semiconductor film by heating after removing the oxide film (or the treatment with the hydrofluoric acid). Furthermore, the present specification teaches that certain advantages may be achieved by performing the steps of the present claims in a specific order. For example, Embodiment 1, at page 16, lines 29-35, teaches as follows (emphasis added):

Incidentally, it is desirable to wash the surface of the polysilicon film 106 by a hydrofluoric acid based etchant before this furnace annealing step is carried out. That is, such contrivance is effective that a natural oxidation film is removed and silicon atoms on the surface are terminated with hydrogen to prevent a natural oxidation film from being formed before an actual treatment.

That is, by removing the oxide film after laser irradiation and before leveling a surface of a semiconductor film, a formation of a natural oxidation film can be prevented.

On the other hand, Morosawa teaches various heating processes, and the Official Action asserts that the heating processes of Morosawa correspond with the claimed leveling step. The Applicant respectfully disagrees. In Morosawa, the first heating step is a dehydrogenation treatment in nitrogen atmosphere at 450°C for one hour (paragraph [0007]), which takes place before laser annealing (paragraph [0009]). The second heating step is a heat-treatment in nitrogen or oxygen atmosphere at 500°C (paragraph [0010]), which takes place after laser annealing and before a natural oxide is formed. The third heating step is performed during formation of a gate insulating film by a plasma CVD method, which takes place after formation of a gate insulating film by a sputtering method (paragraph [0011]). However, Morosawa does not teach or suggest removing an oxide film from a surface of a semiconductor film by etching after irradiation of a laser light and before leveling the surface of the semiconductor film by heating. Also, Morosawa does not teach or suggest that its steps could or should be arranged or that any particular advantage would be gained if the steps of Morosawa were rearranged.

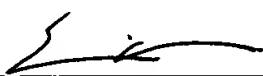
As noted in the previous *Response*, Nakajima does not cure the deficiencies in Morosawa.

Therefore, Morosawa, either alone or in combination with Nakajima, does not teach or suggest irradiating a semiconductor film with laser light for crystallizing the semiconductor film; removing an oxide film from a surface of the semiconductor film by etching (or treating a surface of the semiconductor film with a hydrofluoric acid) after the irradiation of the laser light; and leveling the surface of the semiconductor film by heating after removing the oxide film (or the treatment with the hydrofluoric acid).

Since Morosawa, either alone or in combination with Nakajima, does not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a) are in order and respectfully requested.

Should the Examiner believe that anything further would be desirable to place this application in better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,



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